

Atty. Dkt. No. 30488-1016
Express Mail No. EL 684 470 719 US

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

SHOCK-RESISTANT AND ENVIRONMENTALLY SEALED CONTAINER

Inventors: Jeffrey D. Arnett
Matthew P. Thomas
Alan K. Uke

SHOCK-RESISTANT AND ENVIRONMENTALLY SEALED CONTAINER

Field Of The Invention

The present invention generally relates to containers. More particularly, the invention concerns containers that are both shock-resistant and environmentally sealed.

Background Of The Invention

A wide variety of containers are used everyday to transport the goods that comprise the modern global economy. An ever-increasing part of the new economy are electronic devices such as digital cameras, personal digital assistants, and other apparatus. However, containers that were previously suitable for transporting mechanical goods are not capable of safely shipping the delicate electronic devices of today. Moreover, the technology employed by the transport industry has not kept pace with the goods it transports. For example, shipping containers continue to be dropped by careless handlers and goods shipped overseas are subjected to a host of adverse environmental conditions.

In response, electronics and other manufacturers are demanding new containers that can survive drop tests and pressure tests, that are aimed at protecting their products from high humidity, moisture and the severe impacts that can occur during shipment.

However, the new containers have several shortcomings. For instance, containers designed to be airtight and waterproof employ a sealing ring to seal the container. When the container is closed, the sealing ring is partially compressed. However, upon impact, the seal compresses completely, which allows the latches to loosen, resulting in a container that opens unexpectedly. In addition, the severe impact tests also destroy container hinges which cause the containers to break apart. Additional problems include

extending around the container protect the handles, latches and the top and bottom sections of the container from severe impact. In addition, a removable hinge pin is included which permits the two sections comprising the container to be completely separated from each other. This modification can be accomplished by hand, without the
5 use of any tools.

Brief Description Of The Drawings

The nature, goals, and advantages of the invention will become more apparent to those skilled in the art after considering the following detailed description when read in
10 connection with the accompanying drawing in which like reference numerals identify like elements throughout wherein:

FIG. 1 is a perspective view of one embodiment of the shock-resistant and environmentally sealed container;

FIG. 2 is a perspective view of the embodiment of FIG. 1 showing the bottom of
15 the container;

FIG. 3 is an elevation view of a front side of the container illustrated in FIG. 1;

FIG. 4 is an elevation view of the hinge side of the container illustrated in FIG. 1;

FIG. 5 is a sectional view taken along cutting plane 5--5 of FIG. 3;

FIG. 6 is a perspective view of one embodiment of a latch used to secure the
20 container illustrated in FIG. 1;

FIG. 7 is an elevation view of the latch illustrated in FIG. 6;

FIG. 8 is a side elevation sectional view of the latch illustrated in FIG. 6 attached to the container illustrated in FIG. 1;

FIG. 9 is an elevation view of the latch and surrounding area illustrated in FIG. 8;

container 20 when it is closed. The container 20 incorporates several unique features that permit it to securely transport delicate and fragile object without the risk of opening as result of mishandling or inadvertent accidents.

FIGS. 1-4 illustrate a container 20 having a top or first section 25 and a bottom or second section 30. The container 20 is substantially rectangular, but it will be appreciated that other container shapes, such as squares or more elongated rectangles, may also be constructed using principles according to the present invention. In the illustrated embodiment, eight ribs 45 extend around the outer surface of the container 20. Additional rib portions 45 also extend along the sides of the container 45. For example, illustrated in FIG. 3 the front side 35 has six rib portions 45. Shown in FIG. 4, the hinge side 40 of the container 20 has four rib portions 45. It will be appreciated that the number of ribs 45 can vary depending upon the strength requirements and aesthetic requirement of the container 20. In a preferred embodiment, the ribs are molded integrally into the first and second sections 25 and 30, respectively. The container 20, including ribs 45, is injection-molded using acrylonitrile-butadiene-styrene (ABS). It will be appreciated that other types of plastics or other composite materials can be used to manufacture the container 20. Ribs 45 add structural strength to the container by increasing the bending and torsional stiffness of the container 20. In addition, as illustrated in FIGS. 1 and 2, the ribs extend past the latches 85, handles 55 and other objects positioned on the outside of the container 20, thereby protecting the objects from damage.

Referring now to FIGS. 3 and 5, the ribs 45 in conjunction with overlapping tabs 27 keep the first section 25 from being torn-off or otherwise removed from the second

section 30 during impacts. Overlapping tabs 27 are connected to the first section 25 and overlap over the second section 30. Shown in FIG. 5, parting line 32 defines the meeting point of first section 25 and second section 30. Overlapping tab 27 extends over the parting line 32 from the first section 25 over the second section 30. Referring now to

5 FIG. 3, the overlapping tabs 27 closely abut the rib sides 47. The distance between the rib sides 47 and the overlapping tabs 27 can range from about 0.01 inches to about 0.1 inches. When the container 20 is dropped or otherwise mishandled and encounters a force on load on the first section 25, that load is transferred to the second section 30 through the overlapping tabs and into the ribs sides 47. In this manner, the rib sides 47

10 support the first section 25 and keep the first section 25 from deflecting relative to the second section 30. This ensures that the first section 25 remains securely attached to the second section 30 thereby keeping the container 20 environmentally sealed even under severe impact loads.

Referring now to FIGS. 6-9, a latch 85 constructed in accordance with the present

15 invention is illustrated. Latch 85 includes a bushing 95 located in a cylindrical cavity 87 of latch 85. One embodiment of the bushing 95 comprises a cylindrically-shaped bushing having an outer surface comprised of a series of projections running along the longitudinal-axis of the bushing 95. It will be appreciated that other versions of the bushing 95 could be employed such as one or more bushings positioned within the

20 cylindrical cavity 87 of the latch 85. Bushing 95 has a central aperture extending along its longitudinal axis which is sized to receive a latch pin 100, shown in FIGS. 8 and 9. In one embodiment, latch pin 100 is mounted in first section 25, but it will be appreciated that the latch pin 100 could be mounted in the bottom section 30. Latch 85 is pivotally

coupled to the first section 25 by the latch pin 100 which is inserted through the bushing 95. When the container 20 is closed, latch 85 can be rotated about the latch pin 100 so that latch locking ridge 110 frictionally engages the container locking ridge 115, shown in FIG. 8. In this manner, the two container sections 25 and 30 are securely held together. When desired, the container 20 can be opened by pulling on the finger grip 105 and releasing the latch 85 from the container locking ridge 115 and pivoting the latch 85 about the latch pin 100. Advantageously, latch pin 100 is mounted in a double-shear arrangement in ribs 45, resulting in an extremely strong and durable latch 85 mount.

Referring now to FIG. 8, gasket 120 is positioned between the first section 25 and the second section 30 of the container 20. In one embodiment the gasket 120 resides in a recessed channel in the first section 25, but it will be appreciated that the gasket 120 can also be located in the second section 30. Gasket 120 creates an airtight and waterproof seal by sealing the first section 25 to the second section 30. In a preferred embodiment gasket 120 is made of a soft rubber or plastic material and has a substantially D-shape with a hollow center section. However, it will be appreciated that solid gasket or gaskets of other configurations such as O-rings can be employed.

Referring now to FIG. 8, one advantage of the present invention is illustrated. When a force or load is exerted against the top section 25 of the container 20, such as when the container 20 is dropped, the top section 25 presses against the bottom section 30, compressing gasket 120. Latch pin 100, which is also connected to first section 25 compresses bushing 95 as the top section 25 is forced against the bottom section 30. In contrast to conventional latch systems that are rigidly mounted, and that would release and allow the container 20 to open, the latch system of the present invention can absorb

advantage of the present invention is the use of a latch pin 100 that deflects, thereby absorbing the manufacturing tolerances of the military latch 90. Illustrated in FIG. 11, latch pin 100 is engaged by the pin engaging member 97 and when twist tab 92 is rotated by an operator the latch pin 100 deflects, closing the container 20. The deflection of the latch pin 100 absorbs the manufacturing tolerances in contrast to prior latching systems that permitted the military latch 90 to release inadvertently during shipment. In addition, the latch pin 100 absorbs the compression of the gasket 120 when the container 20 encounters impacts or loads. As discussed above, the gasket 120 can compress during severe impacts causing the first section 25 and second sections 30 to compress together creating slack in the military latches 90. The deflectable latch pin 100 absorbs this slack keeping the military latch 90 secured about the latch pin 100 and keeping the container 20 closed. Also shown in FIGS. 10-11 is deflectable pin stop 94. The deflectable pin stop 94 acts as a support or deflection limiting member to the deflectable latch pin 100. When severe impacts are encountered by the container 20, the first section 25 and the second section 30 can move relative to each other causing the latch pin 100 to deflect. Under extreme impacts, the deflectable latch pin 100 may deflect to the point where pin engaging member 97 disengages from the deflectable latch pin 100, allowing the container 20 to open. With the deflectable pin stop 94 positioned adjacent to the deflectable latch pin 100, the total amount of deflection of the latch pin 100 is limited. Limiting the deflection of the latch pin 100 keeps the pin engaging member 97 of the military latch 90 firmly engaged with the latch pin 100 even under extreme impacts. As shown in FIG. 11, when a load is encountered, the latch pin 100 deflects contacting deflectable pin stop 94, thereby limiting the deflection of the latch pin 100 and ensuring

that the pin engaging member 97 remains attached to the deflectable latch pin 100. Preferably, latch pin 100 is made of tempered spring-steel. It will be appreciated that other types of materials can be used to make latch pin 100 so that it can deflect and spring back into position. In one embodiment latch pin 100 is about 0.175 inches in diameter, and can be easily replaced by pushing the latch pin 100 through ribs 45.

Advantageously, container 20, constructed according to the present invention, can accept either the military latch 90 or the latch 85, without change to the structure of the container 20.

Referring now to FIGS. 2 and 4, a hinge 50 constructed in accordance with the present invention is illustrated. The hinge comprises an elongated rod 52 that is positioned in a plurality of rod receivers 54. The rod receivers 54 are alternatively mounted on the first section 25 and on the second section 30 and are sized to slideably receive the elongated rod 52. One advantage of the present invention is that elongated rod 52 can be easily removed from the rod receivers 54 thereby allowing the first section 25 to be completely separated from second section 30. In this manner, the individual sections can be used to carry the contents of the container 20 or the separate sections can be separated for efficient storage.

Referring now to FIG. 12, locking means for securing the elongated rod 52 to the second section 30 are illustrated. A rod detent 56 is located on the second section 30 of the container 20 and when the elongated rod 52 is inserted into all of the rod receivers 54 the elongated rod end is pivoted so that it engages the rod detent 56 securely. Advantageously, inserting the elongated rod 52 into the rod detent 56 can be performed by hand, yet the arrangement permits the elongated rod 52 to remain secure even under

the most severe shipping impacts. In this manner, the container 20 remains intact under strenuous conditions, yet can be easily separated into first 25 and second 30 sections for use by the operator. It will be appreciated that the rod detent 56 can also be located in the first section 25. In a preferred embodiment the elongated rod 52 is metal, but it will be appreciated that other materials can be employed.

Referring now to FIGS. 3 and 13, a vent 60 is illustrated. Because the container 20 is airtight, conditions may arise where the pressure inside the container is less than the pressure outside the container and an operator will not be able to open the container 20 because of the pressure differential. For example, if the container 20 is filled with goods at a manufacturing facility located at 5,000 above sea level, then shipped to a receiving facility at sea level, a significant pressure differential will exist between the interior of the container 20 and the exterior of the container 20. In this situation it will be extremely difficult, if not impossible, to open the container 20 as a result of the higher pressure outside the container 20 relative to the lower pressure inside the container 20. One advantage of the present invention is that it contains a vent screw 60 that threads into a vent hole 65. When a pressure difference exists, the vent screw 60 is threaded out of the vent hole 65 and air is permitted to enter the interior of the container 20 thereby equalizing air pressure between the inside of the container 20 and the outside of the container 20. It will be appreciated that the vent screw 60 can also be a non-threaded device that permits the equalization of pressures between the inside and outside of the container 20.

Another advantage of the present invention embodied in container 20 are the devices that permit easy transportation of the container 20. For example, handles 55,

embodiment, the handle 70 can be fixed in an extended position by engaging the projection 84 into a projection receiver 86. However, it will be appreciated that the number of projection receivers 86 can be varied to adjust the extendable height of the handle 70.

5 Also shown in FIGS. 13-14 a spring-mounted sphere 130 is positioned near a bottom section of the handle legs 75. In one embodiment, the sphere is a metal ball, but it will be appreciated that a pin or other deflectable member could be positioned in the bottom area of the handle leg 75. The spring-mounted sphere 130 is sized to be received into the sphere receivers 135 located in handle covers 79. The spring-mounted sphere
10 extends into the sphere receivers 135 locking the leg 75 in either a stored position or in an extended position.

One skilled in the art will appreciate that the present invention can be practiced by other than the preferred embodiments which are presented in this description for purposes of illustration and not of limitation, and the present invention is limited only by the
15 claims that follow. It is noted that equivalents for the particular embodiments discussed in this description may practice the invention as well.